

**IMPROVEMENT PRIORITY RATINGS
FOR LOCAL RURAL ROADS
IN INDIANA**

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H.L. Michael

**Joint
Highway
Research
Project**

**PURDUE UNIVERSITY
LAFAYETTE INDIANA**

IMPROVEMENT PRIORITY RATINGS
FOR LOCAL RURAL ROADS IN INDIANA

TO: K. B. Woods, Director
Joint Highway Research Project

FROM: Harold L. Michael, Assistant Director

April 19, 1956

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Attached is a paper entitled "Improvement Priority Ratings for Local Rural Roads in Indiana." This paper was presented by Harold L. Michael at a session of the County Commissioners group during the 42nd Annual Purdue Road School. The material presented is from material prepared by Mr. J. E. Baerwald, formerly of our staff, and Mr. P. E. Henebry, County Commissioner of Allen County, Indiana.

The report includes the procedure for making a county road classification study and the determination of improvement priority ratings. It also includes material about the Allen County study.

This paper will be submitted for inclusion in the Proceedings of the 42nd Annual Purdue Road School.

Respectfully submitted,

Harold L. Michael

Harold L. Michael, Assistant Director
Joint Highway Research Project

HLM:cjg

Attachment

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IMPROVEMENT PRIORITY RAILROADS FOR RURAL ROAD IN INDIA.

RURAL HIGHWAY CLASSIFICATION AND IMPROVEMENT PRIORITIES

FOR INDIA, 1961-62

The 92 county highway department of India has a total of over 76 thousand miles of roads and highways. The roads are classified as primary, secondary, and tertiary. The primary roads are the most important and are the backbone of the road network. They are the roads that connect the major cities and towns. The secondary roads are the roads that connect the secondary cities and towns. The tertiary roads are the roads that connect the tertiary cities and towns. The roads are classified according to their length, width, and the type of traffic they carry. The primary roads are the longest and widest and carry the most traffic. The secondary roads are shorter and narrower and carry less traffic. The tertiary roads are the shortest and narrowest and carry the least traffic. The roads are classified according to their importance and the type of traffic they carry. The primary roads are the most important and carry the most traffic. The secondary roads are the next most important and carry less traffic. The tertiary roads are the least important and carry the least traffic. The roads are classified according to their length, width, and the type of traffic they carry. The primary roads are the longest and widest and carry the most traffic. The secondary roads are shorter and narrower and carry less traffic. The tertiary roads are the shortest and narrowest and carry the least traffic. The roads are classified according to their importance and the type of traffic they carry. The primary roads are the most important and carry the most traffic. The secondary roads are the next most important and carry less traffic. The tertiary roads are the least important and carry the least traffic.

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Thus paper describes the classification and improvement priorities of the roads in India.

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Benefits Derived from Rational Procedures

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Rational procedures for classifying and evaluating the current and potential use and the present physical condition of county highways should provide county officials with a rational basis which serves the following purposes:

1. Relevant facts are assembled in an orderly manner to aid in the establishment of priorities for the construction and reconstruction of highway sections which are suitable, according to established standards, to safety and economically serve the needs of traffic, abutting property, and the public interest.
2. Personal judgment is minimized or eliminated in the assignment of priorities.
3. An objective basis is provided for ranking and other and political pressure in planning, planning and construction.
4. Administrators, engineers and legislators are provided with an average measure of the efficiency of the existing county highway system and an indication of the progress made in the county highway system. This progress, indicated by increased or decreased highway mileage through periodic evaluations, provides a means of measuring the adequacy of road funds.
5. The public's investment in the highway system is protected because funds are budgeted according to the relative order of need.

THE UNIVERSITY OF CHICAGO

Department of
Physics
Chicago, Ill.
June 1954

COUNTY HIGHWAY CLASSIFICATION

Most highway engineers and administrators will agree that it would not only be unnecessary but also be completely undesirable to build and maintain all county highways as high-type pavements. Indiana counties have not nor could they expect to possess sufficient funds, equipment, materials, and manpower to undertake a highway program of such a magnitude. Consequently, it is necessary that the various highways be designated according to their respective importance. The importance of a given highway will vary among different individuals as their dependence on that highway varies, so it is essential that any designation or classification of county highways be made in the public interest.

Before county highways can be classified into various systems it is necessary to determine how many different systems are practical and necessary. A careful consideration of Indiana governmental, financial, and physical conditions has led to the conclusion that three systems of county highways would be most desirable. The degree to which a highway fulfilled the primary purpose of county highways--which is to serve local traffic, abutting property, and the community--is used for classifying the road as a County Primary Highway, a County Secondary Highway, or as a Local Service Highway. The ultimate objective of any classification system is to provide a coordinate arrangement of State, County Primary, County Secondary, and Local Service Highways which will adequately provide for the present and foreseeable future needs of the county.

Traffic volume and character of use should play a major part in the classification of county highways because nearly all Indiana county highway revenues are derived from highway user taxes. On the other hand, the effect of abutting property cannot be completely ignored because of the direct relationship between



land use and traffic generation. Community interest is indicated by the service provided by the highways. This service may be measured by a study of the areas of locations which are linked together by the road service routes or special use made of the highways and the various facilities.

Only a minimum number of miles of county highways could be placed in the County Primary and County Secondary Highway System. This is especially true with limited funds, the mileage to be used is being higher design standards must also be limited.

Future growth and development may also be indicated in the plan, provided a coordinated highway plan which will provide for future as well as current requirements.

Basic Data for Highway Planning

Before a county highway plan can be developed, it is essential that information is available concerning the location, volume of traffic using the road. In 1957, the county highway department, using a survey of traffic volume was showing that the county had all major roads in each district. Current maps may be developed by the county highway department to show selected field stations (number of stations, highway, and other control stations which should be included in the plan) and develop long proper expansion factors to provide a partial and complete plan. The selection of these stations may be influenced by the number of miles and the number of persons available to do the field counting. In the other County Study, for example, 125 eight-hour stations (5 stations at 1 p.m. and 2 p.m. - 5 p.m.) and five 24-hour stations were used.

Field Counting

The 8-hour manual count, or for some other selected period, may be made by volunteers from local organizations such as the Farm Bureau, etc.

high schools, etc. A responsible person, called the Township Captain, is placed in charge of each township. This person aids in the instruction of those who are to serve as manual counters and supervises them during the count period. Transportation is provided to permit him to visit each counter several times during the count period. All completed count forms are collected by the township captain who in turn transmits them to the survey headquarters.

The volunteer counters are assigned to townships other than the one in which they reside. Some persons may object because they will construe this as a questioning of their honesty. Therefore it must be emphasized that the assignments to other townships are being made so that they may become familiar with "the other fellow's" problems.

County officials will find that a volunteer traffic count program can serve as an excellent public relations approach to promote better understanding of local highway problems. Much of this information may be presented during the instruction period for the township captains and in later instruction periods for the manual counters. The completed traffic map is based on the data collected during the count period, and should provide an excellent source of public information.

Average daily traffic volumes are generally used to provide limits for design standards. One common practice for local roads is to provide reasonably high standards for average volumes in excess of 400 vehicles per day, intermediate standards for average volumes between 100 and 400 vehicles per day, and lower standards for average volumes less than 100 vehicles per day. These limits have been used in the Illinois, Mississippi and Ohio highway needs studies and were recommended for use by Indiana counties.

Determination of Abutting Land Use

The necessity for any county highway is directly related to the manner in

which the land adjacent to the highway is used. Thus, roads passing through highly productive farmland may have high seasonal, but low annual traffic volumes, while roads through relatively poor farmland, which has been subject to suburban residential development, may have high daily volumes of traffic. Cultural institutions such as schools and shopping along highways are common; there are impassable much of the time. Recreation parks and other seasonal facilities may be used by highway and attract traffic volumes only during favorable weather conditions, thus for many highways showing traffic volumes on their access roads.

Information concerning the seasonal and other variations in traffic volume is obtained in the field and compared with available records. A field study usually may be made concurrently with the traffic survey.

DATA SOURCES AND FIELD SURVEYS

Community interest may be developed by showing the advantages of access to the highway. A road may be an access to a shopping center, a school, a community and a large attraction for traffic volume. Traffic volume may vary high volumes of traffic between the road and the highway, as from a part of productive area with a distribution of traffic to the highway. Traffic volume may be obtained from a study of local conditions, population, and knowledge of local conditions.

The importance of the various types of service routes is a local matter. Commercial bus, rural mail, milk, oil, and other services are common. The highway varies in each country. It is important for example, to know the rural mileage carried school bus, milk, and rural mail routes that the service routes were of little value in the morning but of value in the afternoon. For classification purposes. Local school boards, milk, and other officials should be consulted for service route information.

The County Primary System

Certain highways, because of their location in the county and method of construction, may have average daily traffic volumes ranging from about 400 vehicles a day to several thousand vehicles a day. These roads may serve to connect a large city with a smaller rural community, or they may serve as a vital connecting link between two major highways or between highly productive areas with the highways. These highways are the type to be considered for inclusion in the County Primary System.

The Secondary System

Roads which carry traffic volumes ranging from about 400 vehicles a day generally belong in the County Secondary System. These roads are used by local roads, such as connecting local farms or communities with the County Primary System, with higher classification roads, or by local traffic. These roads are used for local travel.

The Local Road System

All remaining low traffic volume roads, which are not included in the County Primary or Secondary Systems, are included in the Local Road System. These roads, in general, do not serve as major highways or as major connecting links between the County Primary and Secondary Systems. These roads are used for local travel and consequently may have a lower design standard.

THE HIGHWAY INVENTORY

An accepted and valuable business practice is that of conducting periodic inventories in order to determine the current status of the business. The county highway administrator, like his private business counterpart, should have a vital interest in knowing the present status of his business -- the county road system. Most citizens have definite opinions concerning what is wrong with the county roads and how the problem can be corrected. Consequently, when county road administrators are faced with citizens' complaints on the basis of opinions rather than facts, they are usually unable to make an intelligent reply to criticism from disappointed petitioners.

Generally, records describing the highway system and covering the county road system are inadequate and often are nonexistent. It is therefore essential that the initial inventory be made by means of a procedure that will provide information -- such as highway type, location, right-of-way, shoulder, and roadway widths; roadside culture; type and condition of road surface; and surface; topography; horizontal alignment; and important features -- such as sight distance, safe driving speed, and gradient -- should be recorded for each mile of road. This record will not only provide a permanent record of the actual conditions of the county road system, but it will also provide a basis for determining the essential road conditions and the extent of the existing conditions are readily evident. It is essential that the county highways be properly identified for the purpose of a reliable and complete record of the system.

Inventory Procedures

One or more three man "logging" crews are used to obtain the factual data such as widths, types, etc. One "reading" crew is then assigned to the initial inventory such as condition and adequacy of access, etc. to the logging crew. The number of logging parties depends on the available manpower and time, but should be kept to a minimum in order that comparable information may be obtained. Only

rating party should be used to insure the relative evaluation of all highways.

After completion of the inventory, this information is used to establish priority ratings for each of the various road systems. It appears that the most representative, realistic, and desirable approach to the procedures for rural county highway evaluation should include a measure of the use or service provided by the highway section under question and a measure of the physical condition of that section.

Service Rating

As stated previously, the primary purpose of county highways is to serve local traffic, abutting property, and the community. Information concerning the volume and character of traffic is made available through the traffic count, and knowledge of the land use of abutting property can be obtained during the road inventory. Community service is indicated by the use of certain roads for rural mail routes, school or other scheduled bus routes, and other public services. With the daily traffic volume carrying the most weight, it seems obvious that the more of these three elements (volume and character of traffic, abutting land use, and community service) occurring along a given section of highway, the more critical is the urgency for providing a satisfactory highway to serve this demand. The combination of the traffic, roadside culture, and service factors is called the Service Rating and can range from zero, which indicates no need, to 50. If two road sections have identical unsatisfactory design features, but one road carries a high daily traffic volume through a region of concentrated roadside development, while the other carries a relatively low traffic volume through underdeveloped lands, there seems to be no doubt that the former should have priority. The relative weight allocated to the various elements should be based on judgment which may have to be rather arbitrary because of the lack of reliable information and study in this



area.

Road Ratings

The ability of a highway section to satisfy service demands can be measured when the various elements of the three main factors of structural adequacy, geometric design, and safety are compared with design standards. The most important of these factors is structural adequacy. It includes such elements as pavement type, pavement condition, roadside drainage, structures, and railroad grade crossings. If these elements of structural adequacy are in critical condition, especially pavement condition and structures, the ability of that section of road to provide satisfactory service is definitely limited.

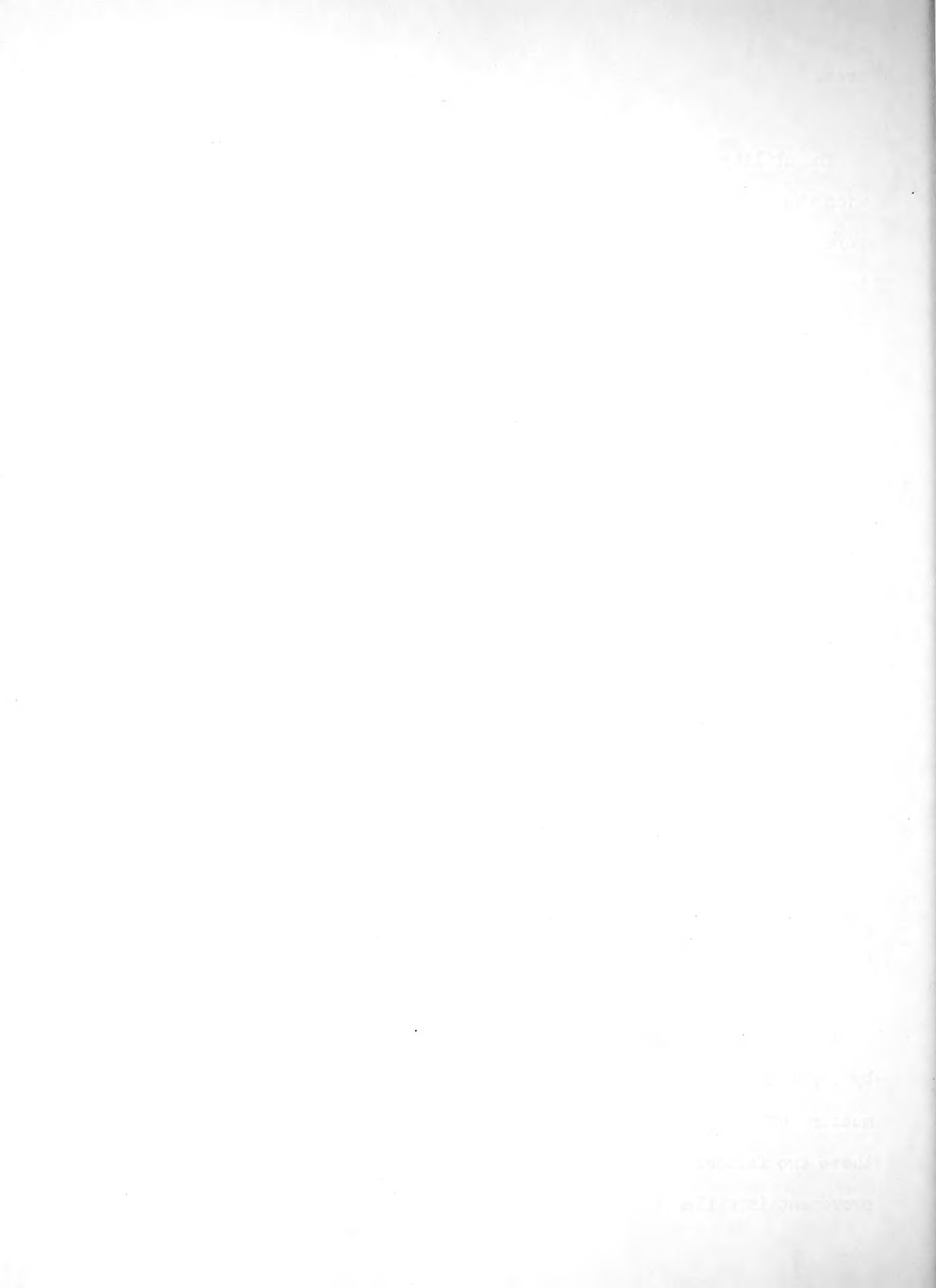
Geometric design elements include right-of-way, pavements, and shoulder widths; gradient; and alignment. The most important of these elements is pavement width, and consequently, it receives a higher value in the rating process.

The safety factor includes such elements as surface riding condition, shoulder condition, safe driving speed, stopping sight distance, and passing sight distance.

The sum of the respective structural adequacy, geometric design, and safety factors is called the Road Rating and the weights assigned to the various factors are generally considered with comparable practice in similar studies. The Road Rating may range from one, which would indicate a complete lack of desirable conditions, to 100, which would indicate a "perfect" highway.

PRIORITY ESTABLISHMENT FOR HIGHWAY IMPROVEMENT

The Service Rating factor is a relative measure of the service furnished by a given section of highway while the Road Rating factor is a relative measure of the physical condition of that highway section. The relating of these two factors to each other to establish a numerical priority for improvement is called the Priority Rating.



Comments on the Use of the Priority Rating

The Priority Rating has been developed to rank highway sections within a given highway classification. In other words, county primary highways are not to be compared with county secondary or local service highways, or vice versa, because the Road Ratings are based on different design standards. County administrators should decide how funds are to be allocated between the various classification systems and then the Priority Rating should be used to establish the urgency of various highway sections within the classification system.

The ranking of the different highway sections should be considered as the important purpose of the Priority Rating function. Because all rankings of highway sections are relative, it does not matter if the various field evaluations are consistently high or low so long as they are consistent.

THE ALLEN COUNTY STUDY

A study of the type just described was performed by the Traffic Engineering Services Unit of the Joint Highway Research Project at Purdue University for Allen County, Indiana. All of the county roads of that county were classified into County Primary, County Secondary, or Local Service roads. Then an inventory of the mileage on the County Primary (145.7 miles) and that on the County Secondary System (137.8 miles) was made and a Priority Rating determined for each road section in each system. A report which included a traffic volume map, road classification map, and the priority ranking of each road in the County Primary and Secondary systems was prepared. Inventory data, design standards and a great amount of other material were also included.

Such a study as described should be performed by each county in Indiana. It is not necessary that Purdue perform the survey, for it can be performed by any competent engineering organization or engineer. In fact, the most

dividends from such a study would be obtained if it were planned, conducted, and placed into operation by a competent engineer. Such an individual would assure that the results would be re-evaluated periodically and provide a continuing supervision over use of the results.

To relate what Allen County achieved in this study, reproduction of an article by Mr. P. E. Henobry, Commissioner of Allen County, and a quote from Mr. Henobry writes:

"For the first time in its history Allen County has developed a realistic approach to its transportation problems.

"Ever since the horse and buggy era, road improvement has been a vital part of community progress, and road improvements have been planned on a haphazard basis. Today we have a scientific engineering survey of our highway needs and can develop an orderly and systematic improvement program. To make the survey we needed cross-sections and a plan of our existing roads. This was a pioneer movement, never before attempted in Indiana. We had to feel our way cautiously. We developed a test application of the plan to the rural areas.

"First, we told them that the plan was experimental and that the results were imperative. We also emphasized that the plan was not binding on the county, but was a suggestion. We also emphasized that the plan was not binding on the county, but was a suggestion.

"Then, too, we kept emphasizing the importance of the plan for the improvements and that we believed that the plan should be made as far as roads are concerned - traffic-wise speaking.

"We ourselves knew that this highway engineering survey, if successful, would provide us with ample ammunition to resist the numerous attempts to resist those seeking personal favors or even political consideration.

"We who are responsible for road improvement know that it is only natural

that the road which provides on land itself is the most important of all roads. That particular road should be first on the program.

"As a result of this situation with this individual and the fact that is being done in the country, we have to see that they have the right to the country.

"We have to have a plan for the future. We have to have a plan for the future to use our limited resources.

"As a result of this situation, we have to have a plan for the future. We have to have a plan for the future to use our limited resources. We have to have a plan for the future to use our limited resources. We have to have a plan for the future to use our limited resources.

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"What else did the people do to the country?"

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"We found that twenty-six and three tenths percent of our roads were used by not less than one hundred nor more than three hundred ninety-nine cars daily, while in the next to the top bracket 10.7 per cent had a traffic count of four hundred to five hundred ninety-nine cars daily. The bottom bracket constituted only nine and ten hundredths percent."

"More revealing was the fact that the roads which carried the greatest amount of traffic were also the most expensive to build. The roads carrying more than five hundred cars daily cost an average of \$1,000 per mile, while the roads carrying less than one hundred cars daily cost an average of \$500 per mile."

"Armed with these facts, the county engineers and the board of supervisors were able to determine the most efficient use of the county road fund."

"The study began in 1917 and continued for two years. It was revised to keep abreast with changing conditions. The study was repeated three or four years after the first one."

"It cost our county only \$10,000 to make this study. The cost of that expense represented only a small fraction of the cost of the road program."

"We, in Allen County, believe that the study of the county road work ever made."

"We now know more than ever before about the most efficient use of the greatest service to the greatest number of people."

"We know also that since road conditions are constantly changing, improvements should be made where they are needed."

"We only wish that this survey had been taken some years ago when our traffic problems first began to trouble us. It would have been a forward step in highway improvement. It would have shown us where and how to better our county road program."

Any county can do the same. Allen County is a guide.

